

Ground Water Quality Characterization and Initial Trend Analysis for the Treasure Valley Shallow and Deep Hydrogeologic Subareas

by

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This report was published in 1998. The following sections are included on this web page: 1) Table of Contents, 2) Abstract, and 3) Some Examples of Graphics from the Treasure Valley ground water quality report. For a complete copy of the report, please contact Ken Neely or Janet Crockett

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Abstract

This report describes the ground water quality in the Treasure Valley Shallow (TVS) and Treasure Valley Deep (TVD) hydrogeologic subareas as determined from data collected through the Statewide Ambient Ground Water Quality Monitoring Program (Statewide Program). The Statewide Program is administered by the Idaho Department of Water Resources in cooperation with the United States Geological Survey-Water Resources Division. The TVS and TVD are two of the 20 subareas in the Statewide Program. The TVS and TVD subareas are located primarily in Ada and Canyon counties of southwestern Idaho. Ground water quality data were collected from 144 Statewide Program monitoring sites (existing wells) in the TVS subarea and 137 sites in the TVD subarea during the summer field seasons from 1991 through 1994. Data collection that occurred during these four years is referred to as First Round sampling. Second Round sampling began in 1995. Most of the sites sampled in 1991 through 1993 were re-sampled in 1995 through 1997, respectively. Ground water quality was characterized for the two subareas using First Round data. Initial trend analyses were conducted using Second Round data.

Aquifers in the TVS subarea occur in the unconsolidated gravels and coarse grained sands of the Snake River Group. Aquifers in the TVD subarea consist of the fine to medium grained

sands and occasional gravels that are often interbedded with thick clay layers. TVD aquifers occur primarily in the Idaho Group. The top of the TVD subarea was usually determined by the first occurrence of blue or gray clay in the well cuttings.

Characterization of the water quality data collected from 1991 through 1994 indicated that the dominant water types were calcium-bicarbonate and sodium-bicarbonate for both subareas. Trilinear plots showed that the overall water quality was more variable for the TVD subarea than for the TVS subarea. Results from Mann-Whitney rank-sum tests showed that there were significant differences in the median concentrations at the 95 percent confidence level between the two subareas for 18 of the 22 water quality constituents and parameters tested. Overall, ground waters of the TVS subarea were more mineralized than ground waters of the TVD subarea.

The ground water at most of the Statewide Program monitoring sites in the TVS and TVD subareas was suitable for human consumption and other beneficial uses. However, 49 of the 281 sites (17 percent) had one or more constituents with concentrations that exceeded the primary Maximum Contaminant Levels (MCLs) as established by the U.S. Environmental Protection Agency (EPA) for public drinking water supplies. The number of sites with detections above the MCLs was 33 for the TVS subarea (23 percent) and 16 for the TVD subarea (12 percent). Arsenic, bacteria, fluoride, gross alpha, gross beta, nitrate and volatile organic compounds were the constituents detected above existing primary MCLs. Sulfate, total dissolved solids and uranium had concentration levels above secondary MCLs or proposed primary MCLs.

Nitrate and pesticide data showed that impact to the ground water quality from human activities has occurred in the Treasure Valley, particularly in the TVS subarea. One hundred of the 144 TVS subarea sites (69 percent) had nitrate concentrations equal to or greater than 2.0 milligrams per liter (mg/l) which is the value used by the Statewide Program to distinguish between non-impacted and impacted nitrate levels. The number of sites with nitrate concentrations equal to or greater than 2.0 mg/l for the TVD subarea was 44 (32 percent). One or more pesticides were detected at 32 of 139 TVS sites (23 percent) analyzed by immunoassay methods with detection limits in the parts per billion range. Eighty-two of the 98 TVS sites (84 percent) analyzed by a gas chromatography (GC) method with detection limits in the parts per trillion range had one or more pesticide detections. All immunoassay and GC pesticide detections were below MCLs with most concentrations being at least one order of magnitude below MCLs.

Initial trend monitoring data showed that nitrate concentrations increased at 66 of the 92 TVS subarea sites (72 percent) sampled in the First Round and re-sampled in the Second Round. Individual nitrate increases ranged from 0.03 to 11.9 mg/l. The number of TVS sites with nitrate concentrations greater than the MCL of 10 mg/l increased from two (First Round) to seven (Second Round). Median nitrate values for the TVS subarea increased from 3.35 mg/l (First Round) to 3.87 mg/l (Second Round). Mann-Whitney signed-rank test results indicated that the increase in nitrate medians between the First and Second Rounds for the TVS subarea was significant at the 95 percent confidence level. Median nitrate values for the TVD subarea were 0.87 mg/l (First Round) and 0.69 mg/l (Second Round); these medians were not significantly different at the 95 percent confidence level.

Some Examples of Graphics From the Treasure Valley Ground Water Quality Report

Figure 35. Dissolved nitrate concentrations for the Treasure Valley Shallow subarea, 1991-1994.

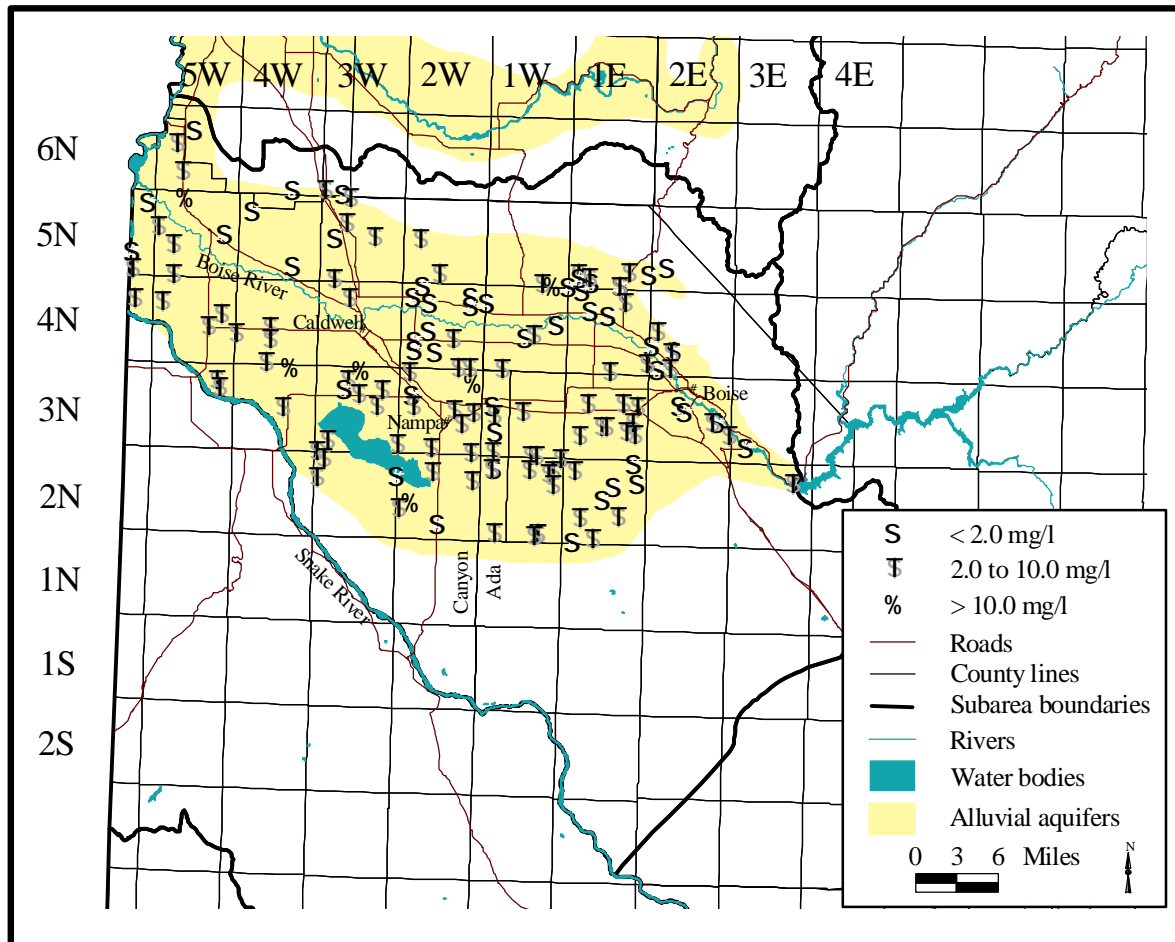


Figure 40. Dissolved nitrate concentrations for the Treasure Valley Deep subarea, 1991-1994.

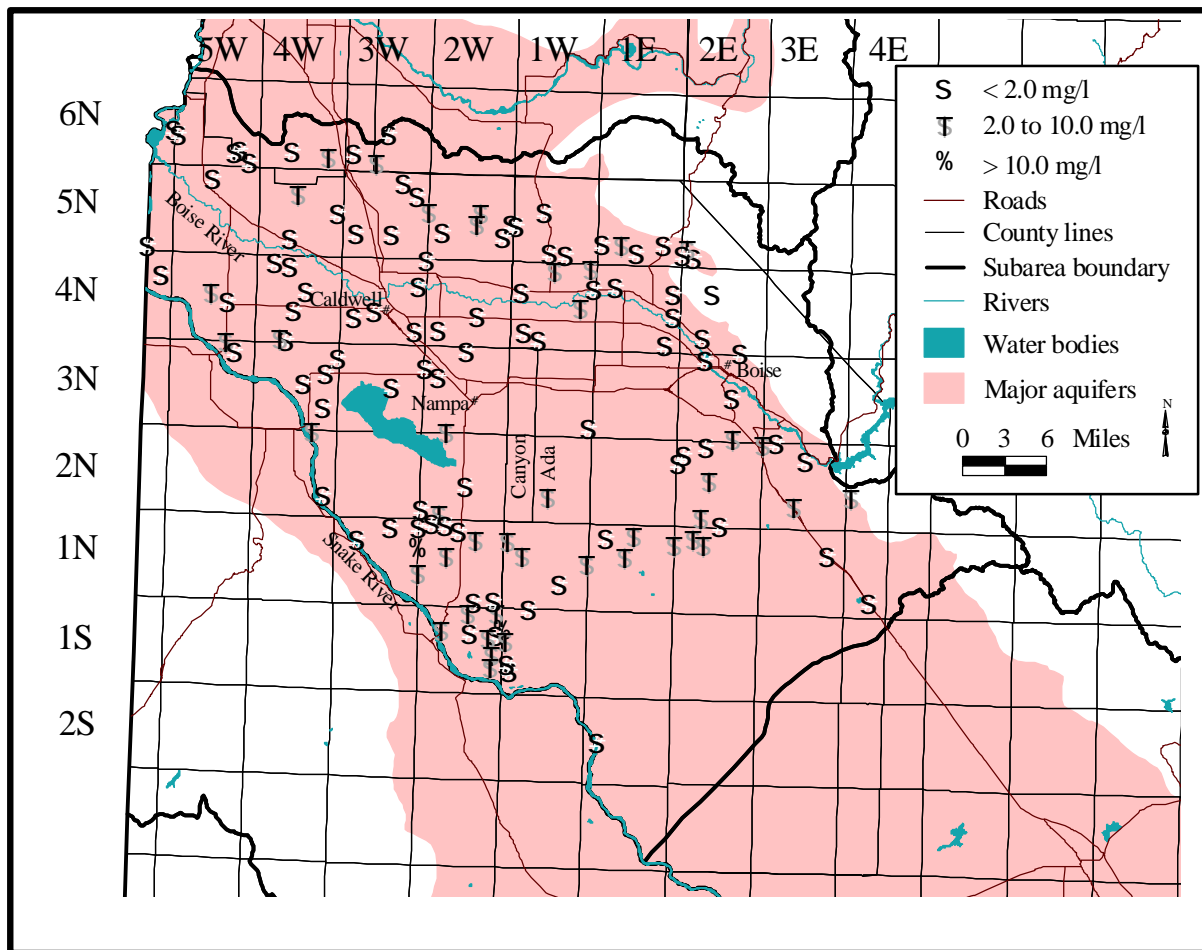


Figure 33. Pie charts showing ranges of nitrate concentrations and associated percentages for the TVS and TVD subareas, 1991-1994.

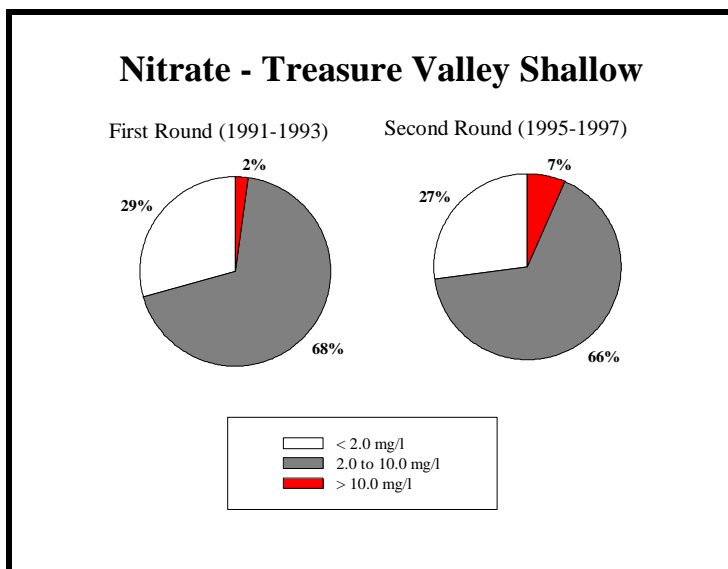
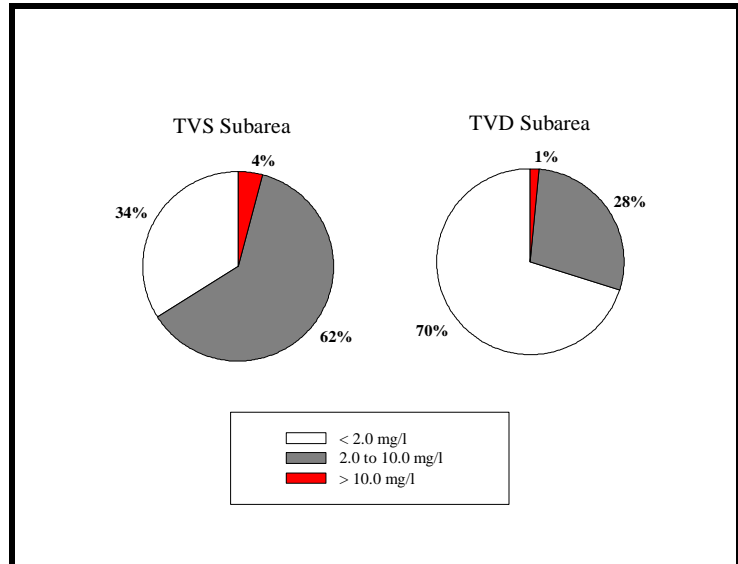


Figure 57. Pie graphs showing nitrate concentration percentages for the First and Second Round sampling for the Treasure Valley

Shallow subarea. (Note: the percentages for the Second Round shown here are slightly different than those shown in the report; the report is incorrect)

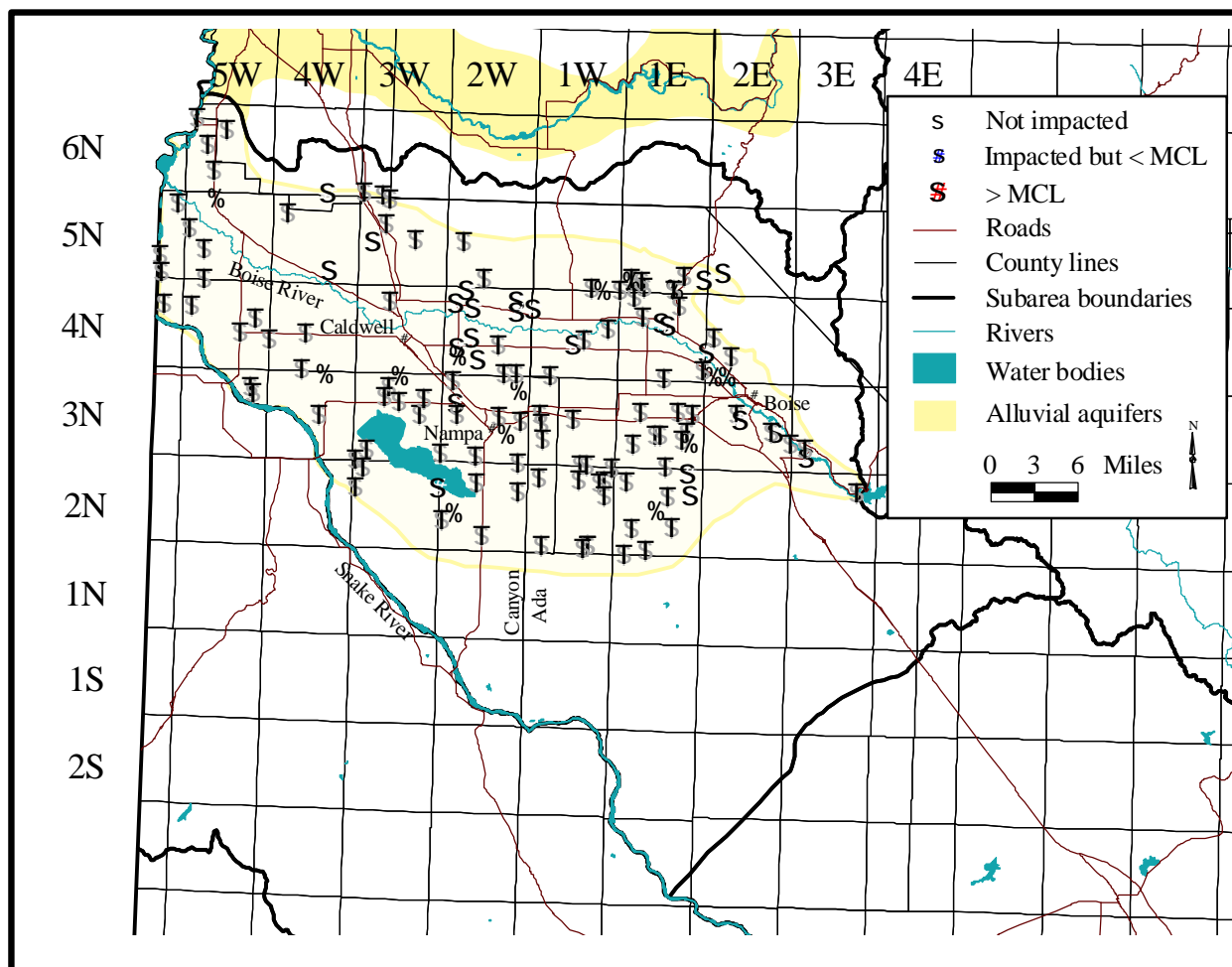


Figure 62. Human-induced ground water quality impacts and MCL exceedances for ammonia, bacteria, nitrate, pesticides, phosphorus and volatile organic compounds for the TVS subarea.